

The microprocessor 1138 also interacts with other device subsystems, such as the display 1122, Flash memory 1124, RAM 1126, auxiliary input/output (I/O) subsystems 1128, serial port 1130, keyboard 1132, speaker 1134, microphone 1136, a short-range communications subsystem 1140 and any other device subsystems generally designated as 1142.

Some of the subsystems shown in Fig. 11 perform communication-related functions, whereas other subsystems may provide “resident” or on-device functions. Notably, some subsystems, such as keyboard 1132 and display 1122 may be used for both communication-related functions, such as entering a text message for transmission over a data communication network, and device-resident functions such as a calculator or task list or other PDA type functions.

Operating system software used by the microprocessor 1138 is preferably stored in a persistent store such as Flash memory 1124. In addition to the operating system, which controls low-level functions of the mobile device 1110, the Flash memory 1124 may include a plurality of high-level software application programs, or modules, such as a voice communication module 1124A, a data communication module 1124B, an organizer module (not shown), or any other type of software module 1124N. These modules are executed by the microprocessor 1138 and provide a high-level interface between a user and the mobile device 100. This interface typically includes a graphical component provided through the display 1122, and an input/output component provided through the auxiliary I/O 1128, keyboard 1132, speaker 1134, and microphone 1136. The operating system, specific device applications or modules, or parts thereof, may be temporarily loaded into a volatile store, such as RAM 1126 for faster operation. Moreover, received communication signals may also be temporarily stored to RAM 1126, before

permanently writing them to a file system located in a persistent store such as the Flash memory 1124.

An exemplary application module 1124N that may be loaded onto the mobile device 100 is a personal information manager (PIM) application providing PDA functionality, such as calendar events, appointments, and task items. This module 1124N may also interact with the voice communication module 1124A for managing phone calls, voice mails, etc., and may also interact with the data communication module for managing e-mail communications and other data transmissions. Alternatively, all of the functionality of the voice communication module 1124A and the data communication module 1124B may be integrated into the PIM module.

The Flash memory 1124 preferably also provides a file system to facilitate storage of PIM data items on the device. The PIM application preferably includes the ability to send and receive data items, either by itself, or in conjunction with the voice and data communication modules 1124A, 1124B, via the wireless networks 1119. The PIM data items are preferably seamlessly integrated, synchronized and updated, via the wireless networks 1119, with a corresponding set of data items stored or associated with a host computer system, thereby creating a mirrored system for data items associated with a particular user.

Decrypted session keys or other encryption accessing information is preferably stored on the mobile device 100 in a volatile and non-persistent store such as the RAM 1126. Such information may instead be stored in the Flash memory 1124, for example, when storage intervals are relatively short, such that the information is removed from memory soon after it is stored. However, storage of this information in the RAM 1126 or another volatile and non-persistent store is preferred, in order to ensure that the information is erased from memory when the mobile device 100 loses power. This prevents an unauthorized party from obtaining any

stored encryption accessing information such as a decrypted session key by removing a memory chip from the mobile device 100, for example.

The mobile device 100 may be manually synchronized with a host system by placing the device 100 in an interface cradle, which couples the serial port 1130 of the mobile device 100 to the serial port of a computer system or device. The serial port 1130 may also be used to enable a user to set preferences through an external device or software application, or to download other application modules 1124N for installation. This wired download path may be used to load an encryption key onto the device, which is a more secure method than exchanging encryption information via the wireless network 1119. Interfaces for other wired download paths may be provided in the mobile device 100, in addition to or instead of the serial port 1130. For example, a USB port would provide an interface to a similarly equipped personal computer.

Additional application modules 1124N may be loaded onto the mobile device 100 through the networks 1119, through an auxiliary I/O subsystem 1128, through the serial port 1130, through the short-range communications subsystem 1140, or through any other suitable subsystem 1142, and installed by a user in the Flash memory 1124 or RAM 1126. Such flexibility in application installation increases the functionality of the mobile device 100 and may provide enhanced on-device functions, communication-related functions, or both. For example, secure communication applications may enable electronic commerce functions and other such financial transactions to be performed using the mobile device 100.

When the mobile device 100 is operating in a data communication mode, a received signal, such as a text message or a web page download, will be processed by the transceiver module 1111 and provided to the microprocessor 1138, which will preferably further process the received signal for output to the display 1122, or, alternatively, to an auxiliary I/O device 1128.

A user of mobile device 100 may also compose data items, such as e-mail messages, using the keyboard 1132, which is preferably a complete alphanumeric keyboard laid out in the QWERTY style, although other styles of complete alphanumeric keyboards such as the known DVORAK style may also be used. User input to the mobile device 100 is further enhanced with a plurality of auxiliary I/O devices 1128, which may include a thumbwheel input device, a touchpad, a variety of switches, a rocker input switch, etc. The composed data items input by the user may then be transmitted over the communication networks 1119 via the transceiver module 1111.

When the mobile device 100 is operating in a voice communication mode, the overall operation of the mobile device is substantially similar to the data mode, except that received signals are preferably be output to the speaker 1134 and voice signals for transmission are generated by a microphone 1136. Alternative voice or audio I/O subsystems, such as a voice message recording subsystem, may also be implemented on the mobile device 100. Although voice or audio signal output is preferably accomplished primarily through the speaker 1134, the display 1122 may also be used to provide an indication of the identity of a calling party, the duration of a voice call, or other voice call related information. For example, the microprocessor 1138, in conjunction with the voice communication module and the operating system software, may detect the caller identification information of an incoming voice call and display it on the display 1122.

A short-range communications subsystem 1140 may also be included in the mobile device 100. For example, the subsystem 1140 may include an infrared device and associated circuits and components, or a short-range RF communication module such as a BluetoothTM module or an 802.11 module to provide for communication with similarly-enabled systems and devices. Those skilled in the art will appreciate that "Bluetooth" and "802.11" refer to sets of

specifications, available from the Institute of Electrical and Electronics Engineers, relating to wireless personal area networks and wireless local area networks, respectively.

WHAT IS CLAIMED AS THE INVENTION IS:

1. A method for processing encrypted messages at a wireless mobile communication device, comprising the steps of:

receiving at the wireless mobile communication device an encrypted message comprising at least one encrypted session key and encrypted content;

accessing the encrypted message;

identifying an individual encrypted session key associated with the wireless mobile communication device;

decrypting the individual encrypted session key; and

storing the decrypted session key to memory;

wherein the stored decrypted session key is used to decrypt the encrypted content of the encrypted message where the encrypted content is subsequently accessed.

2. The method of claim 1, wherein the encrypted message is received by the wireless mobile communication device through a wireless infrastructure and a wireless network.

3. The method of claim 2, wherein a message server transmits the encrypted message through the wireless infrastructure and the wireless network to the wireless mobile communication device.

4. The method of claim 3, wherein the message server receives the encrypted message from a message sender.

5. The method of claim 4, wherein the wireless mobile communication device requests in a pull message access scheme that stored messages be forwarded by the message server to the wireless mobile communication device.
6. The method of claim 4, wherein the message server routes the encrypted message to the wireless mobile communication device when the encrypted message is received at the message server, and wherein the encrypted message is addressed by the message sender using a specific e-mail address associated with the wireless mobile communication device.
7. The method of claim 4, wherein the message server redirects the encrypted message to the wireless mobile communication device.
8. The method of claim 4, wherein the message server comprises means for redirecting the encrypted message to the wireless mobile communication device.
9. The method of claim 8, wherein, before the encrypted message is redirected to the wireless mobile communication device, a redirection program re-envelopes the encrypted message so as to maintain the addressing information of the encrypted message.
10. The method of claim 9, wherein the redirection program re-envelopes the encrypted message so as to allow a reply message generated by the wireless mobile communication device to reach the message sender.

11. The method of claim 1, further comprising, after the step of identifying, the steps of:
- determining whether the encrypted session key has been decrypted and stored to the memory; and
- retrieving the decrypted session key from the memory and using the stored decrypted session key to decrypt the encrypted content of the encrypted content where the encrypted session key has been decrypted and stored to the memory.
12. The method of claim 11, wherein the steps of decrypting and storing are performed where the encrypted session key has not been decrypted and stored to the memory.
13. The method of claim 1, wherein certificate information of a user of the wireless mobile communication device is transferred to the wireless mobile communication device through a wireless mobile communication device information transfer means.
14. The method of claim 13, wherein the wireless mobile communication device information transfer means comprises a wireless communication module.
15. The method of claim 14, wherein the wireless communication module is selected from the group consisting of: an infrared device, a Bluetooth module, and an 802.11 module.

16. The method of claim 1, wherein certificate revocation lists are transferred to the wireless mobile communication device through a wireless mobile communication device information transfer means.

17. The method of claim 16, wherein the wireless mobile communication device information transfer means comprises a serial port or a Universal Serial Bus (USB) port.

18. The method of claim 16, wherein the wireless mobile communication device information transfer means comprises an infrared device, a Bluetooth module, or an 802.11 module.

19. The method of claim 1, wherein the encrypted message is received by the wireless mobile communication device through means for providing a wireless infrastructure and through means for providing a wireless network.

20. The method of claim 19, wherein means for providing a message server transmits the encrypted message through the means for providing the wireless infrastructure to the wireless mobile communication device.

21. The method of claim 20, wherein the means for providing a message server receives the encrypted message from a message sender.

22. The method of claim 1, wherein a message server transmits the encrypted message through a wireless infrastructure and a wireless network to the wireless mobile communication device,

wherein the encrypted message comprises a plurality of encrypted session keys, wherein the message server determines the encrypted session key associated with the wireless mobile communication device, and wherein the message server reorganizes the encrypted message such that the encrypted message is sent to the wireless mobile communication device without containing at least one encrypted session key that is not associated with the wireless mobile communication device.

23. The method of claim 22, wherein the encrypted message comprises a digital signature, and wherein the message server verifies the digital signature and sends to the wireless mobile communication device a result of the digital signature verification.

24. The method of claim 1, wherein the encrypted message comprises a plurality of encrypted session keys, wherein the encrypted session keys are associated with different recipients, and wherein the encrypted message is reorganized prior to transmission to the wireless mobile communication device such that the encrypted message is transmitted to the wireless mobile communication device containing only the encrypted session key associated with the wireless mobile communication device.

25. The method of claim 24, wherein the encrypted message comprises a digital signature, and wherein the message server verifies the digital signature and sends to the wireless mobile communication device the result of the digital signature verification.

26. The method of claim 1, wherein the encrypted session key is a one-time session key that is generated and used for the encrypted message.
27. The method of claim 26, wherein the session key was encrypted using a public key associated with the wireless mobile communication device.
28. The method of claim 27, wherein the encrypted message was addressed to more than one receivers, and wherein the same session key is encrypted using a public key associated with each receiver.
29. The method of claim 1, wherein the encrypted content was encrypted using a session key and encryption algorithm, and wherein a public key cryptographic algorithm was used to encrypt the session key to generate the encrypted session key.
30. The method of claim 1, wherein the encrypted message was encrypted using Secure Multipurpose Internet Mail Extensions (S/MIME) techniques.
31. The method of claim 1, wherein the encrypted message was encrypted using Pretty Good Privacy techniques.
32. The method of claim 1, wherein the encrypted message was encrypted using OpenPGP techniques.

33. The method of claim 1, wherein the encrypted message comprises a digital signature.
34. The method of claim 1, wherein the encrypted message comprises an e-mail message.
35. The method of claim 1, wherein the decrypted session key is removed from the memory after a preselected time has elapsed.
36. The method of claim 35, wherein the preselected time is selected by the user.
37. The method of claim 1, wherein the decrypted session key is removed from the memory based upon a characteristic associated with the encrypted message.
38. The method of claim 37, wherein the decrypted session key is removed from the memory based upon electrical power being removed from the wireless mobile communication device.
39. The method of claim 37, wherein the characteristic comprises the identity of a sender of the encrypted message.
40. The method of claim 39, wherein the identity of the sender of the encrypted message comprises an e-mail address of the sender.
41. The method of claim 1, wherein the decrypted session key is removed from the memory based upon a sensitivity level of the encrypted message.

42. The method of claim 41, wherein the sensitivity level is determined based upon a subject line contained within the encrypted message.

43. The method of claim 41, wherein the sensitivity level is determined based upon the encrypted content.

44. The method of claim 1, further comprising the step of:

setting a disabling flag so that the decrypted session key is not continuously stored in the memory for use in additional accesses of the encrypted content.

45. The method of claim 1, further comprising the step of:

setting a disabling flag so that the decrypted session key is removed from the memory after accessing the encrypted content.

46. The method of claim 1, wherein the decrypted session key is stored to a volatile memory of the wireless mobile communication device.

47. The method of claim 1, wherein the decrypted session key is stored to a volatile and non-persistent memory of the wireless mobile communication device.

48. The method of claim 1, wherein the decrypted session key is stored to a random access memory (RAM) of the wireless mobile communication device.

49. The method of claim 1, wherein a user of the wireless mobile communication device enters security information in order to have the encrypted session key decrypted.

50. The method of claim 49, wherein the security information comprises a password.

51. An apparatus for processing encrypted messages at a wireless mobile communication device, comprising:

means for receiving an encrypted message comprising at least one encrypted session key and encrypted content;

means for accessing the encrypted message;

means for identifying an individual encrypted session key associated with the wireless mobile communication device where the encrypted message is accessed by the means for accessing;

means for decrypting the individual encrypted session key; and

means for storing the decrypted session key to memory;

wherein the stored decrypted session key is used to decrypt the encrypted content of the encrypted message where the encrypted content is subsequently accessed by the means for accessing.

52. Computer software stored on a computer readable medium, the computer software comprising program code for carrying out a method that processes an encrypted message at a wireless mobile communication device when the encrypted message is accessed, said encrypted

message containing at least one encrypted session key and encrypted content, said method comprising the steps of:

identifying an individual encrypted session key associated with the wireless mobile communication device where the encrypted message is accessed by the means for accessing;

decrypting the individual encrypted session key;

storing the decrypted session key to memory; and

using the stored decrypted session key to decrypt the encrypted content where the encrypted content is accessed multiple times.

53. An apparatus on a wireless mobile communication device for handling multiple accesses to encrypted content, wherein an encrypted message includes the encrypted content and further includes encryption accessing information, and wherein the encrypted message is transmitted to the wireless mobile communication device, the apparatus comprising:

a storage software module that stores the encryption accessing information in memory which is volatile and non-persistent, wherein the encryption accessing information allows access to the encrypted content; and

an accessing software module that retrieves from the memory the encryption accessing information,

wherein the retrieved encryption accessing information is used to decrypt the encrypted content where the encrypted content is accessed multiple times.

54. The apparatus of claim 53, wherein the encryption accessing information comprises a session key.

55. The apparatus of claim 53, wherein the encrypted message further comprises a digital signature, wherein the storage software module stores, in the memory, verification information about the digital signature, and wherein the software accessing module retrieves from the memory the verification information when the encrypted content is accessed multiple times.

56. The apparatus of claim 55, further comprising a data structure stored in the memory for containing the verification information and the encryption accessing information.

57. The apparatus of claim 56, wherein the wireless mobile communication device receives a plurality of encrypted messages, and wherein the data structure associates which encryption accessing information is associated with which message.

58. The apparatus of claim 57, wherein the data structure associates which verification information is associated with which message.

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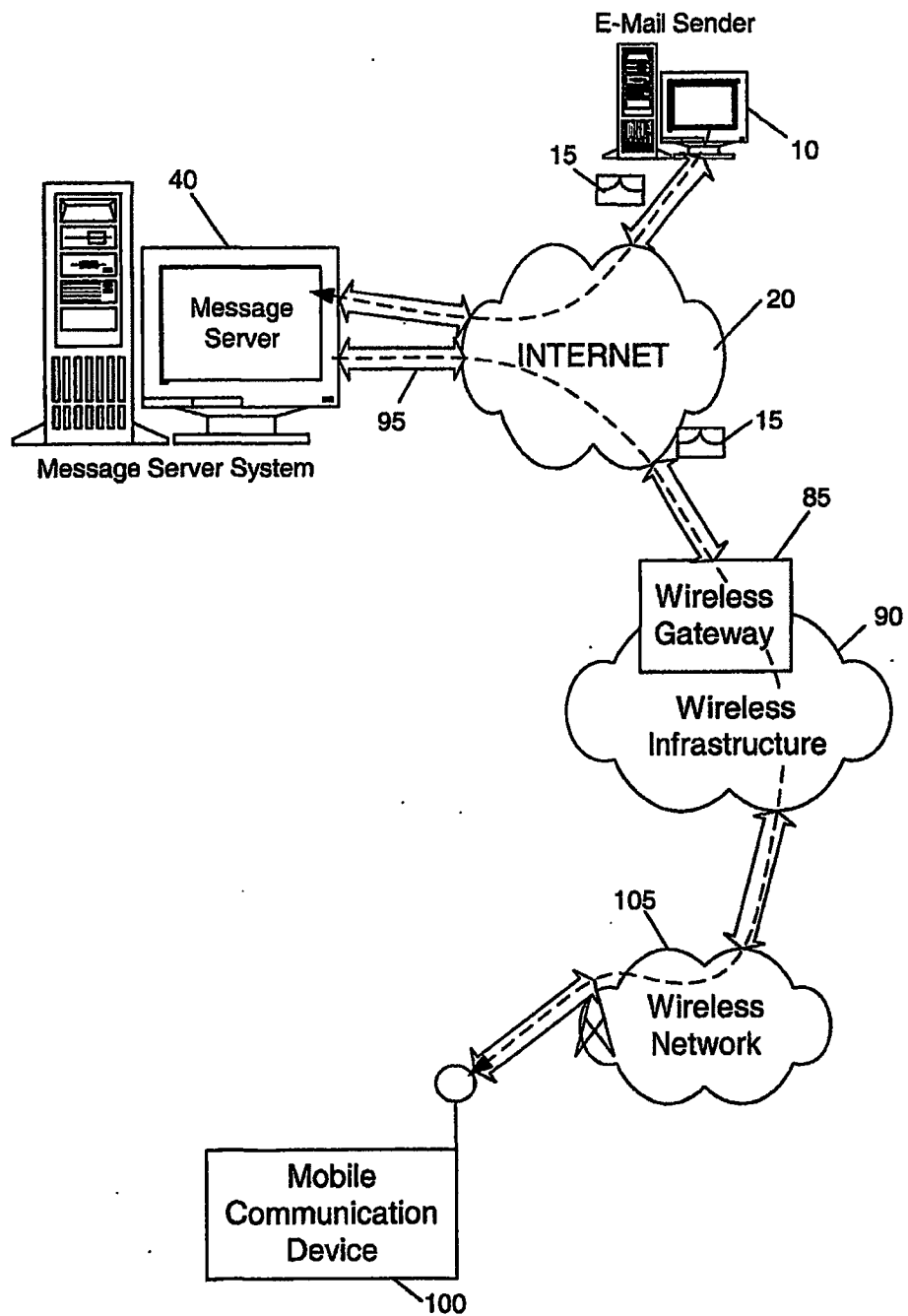


FIG. 1

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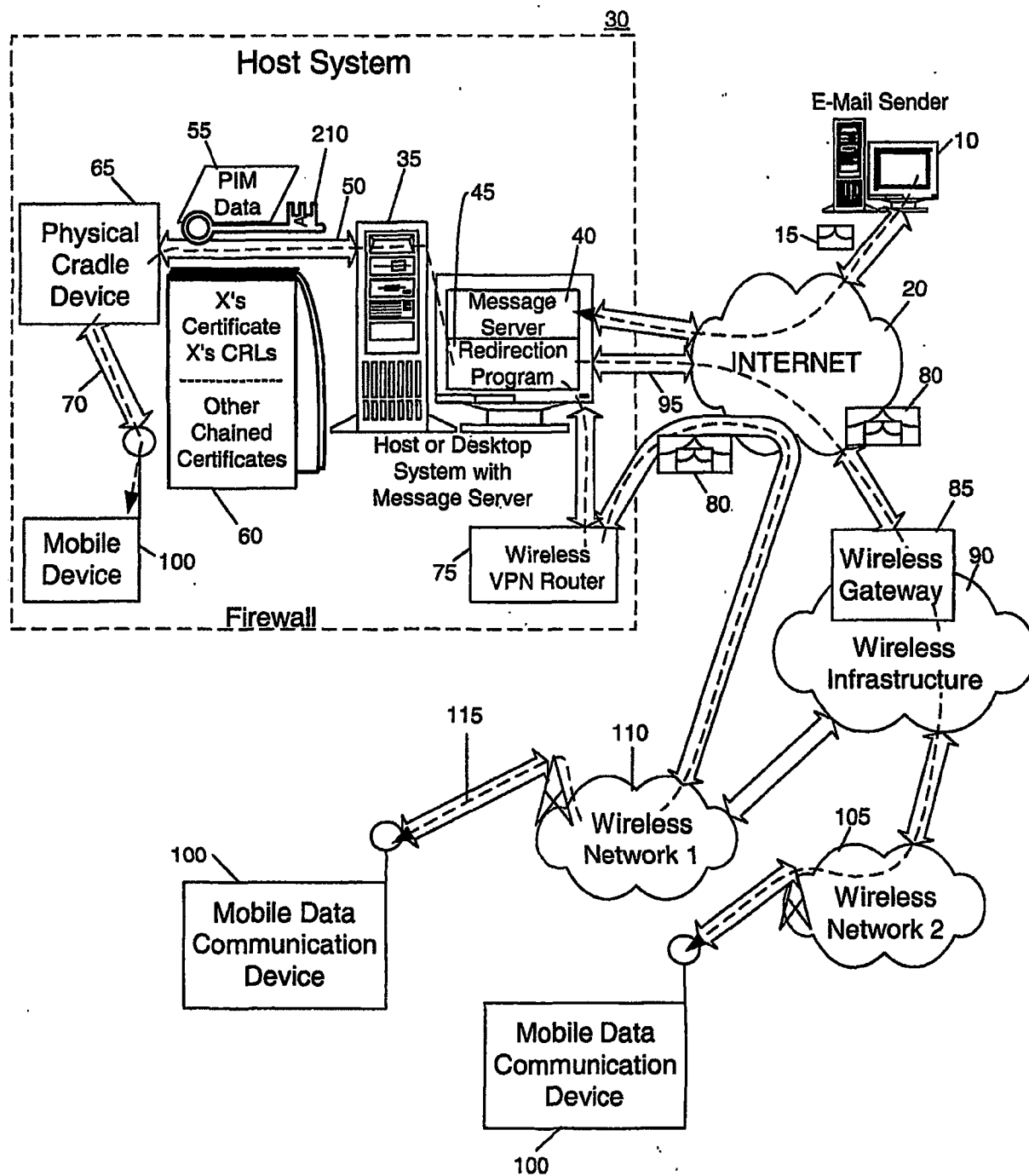


FIG. 2

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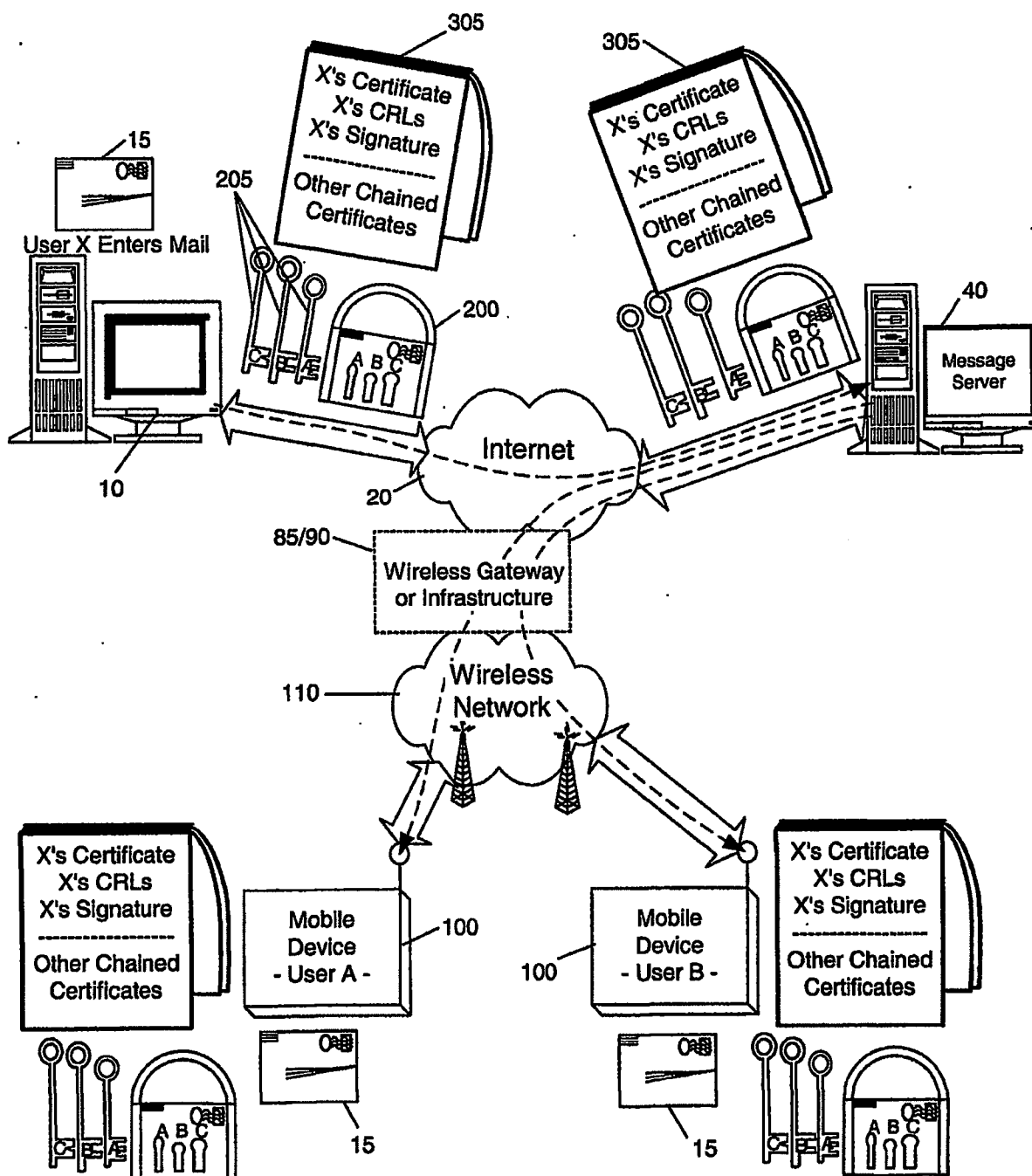


FIG. 3

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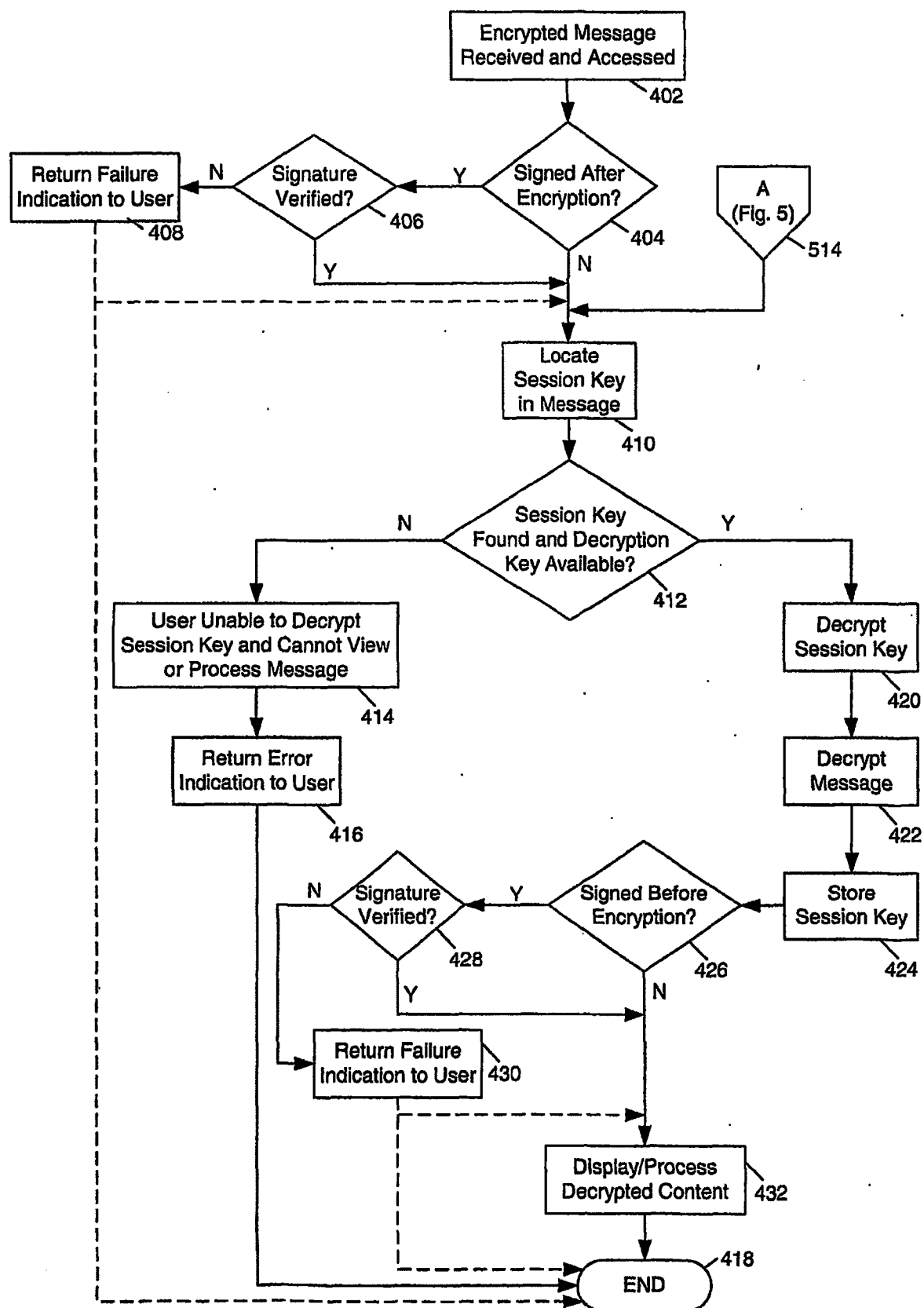


FIG. 4

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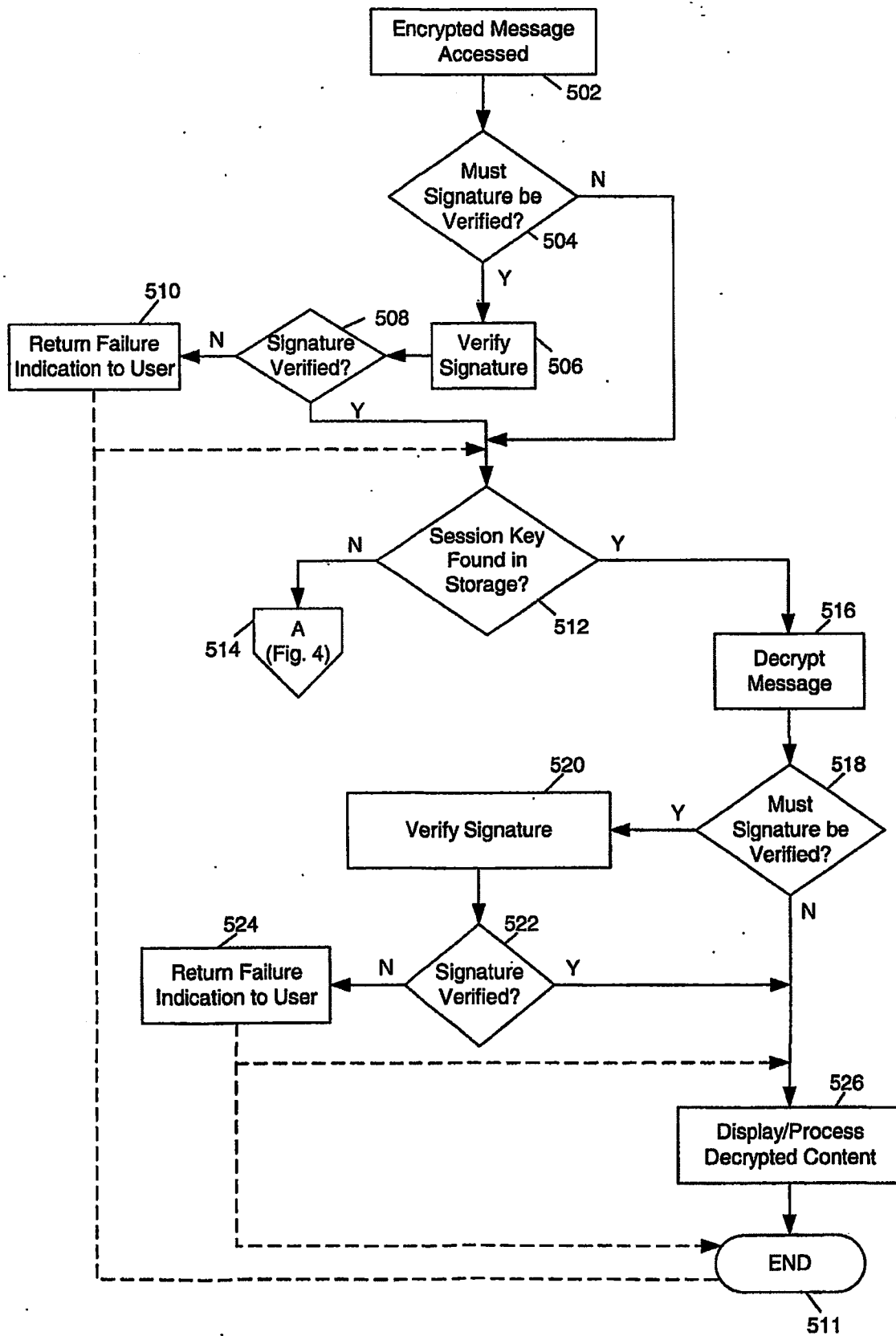


FIG. 5

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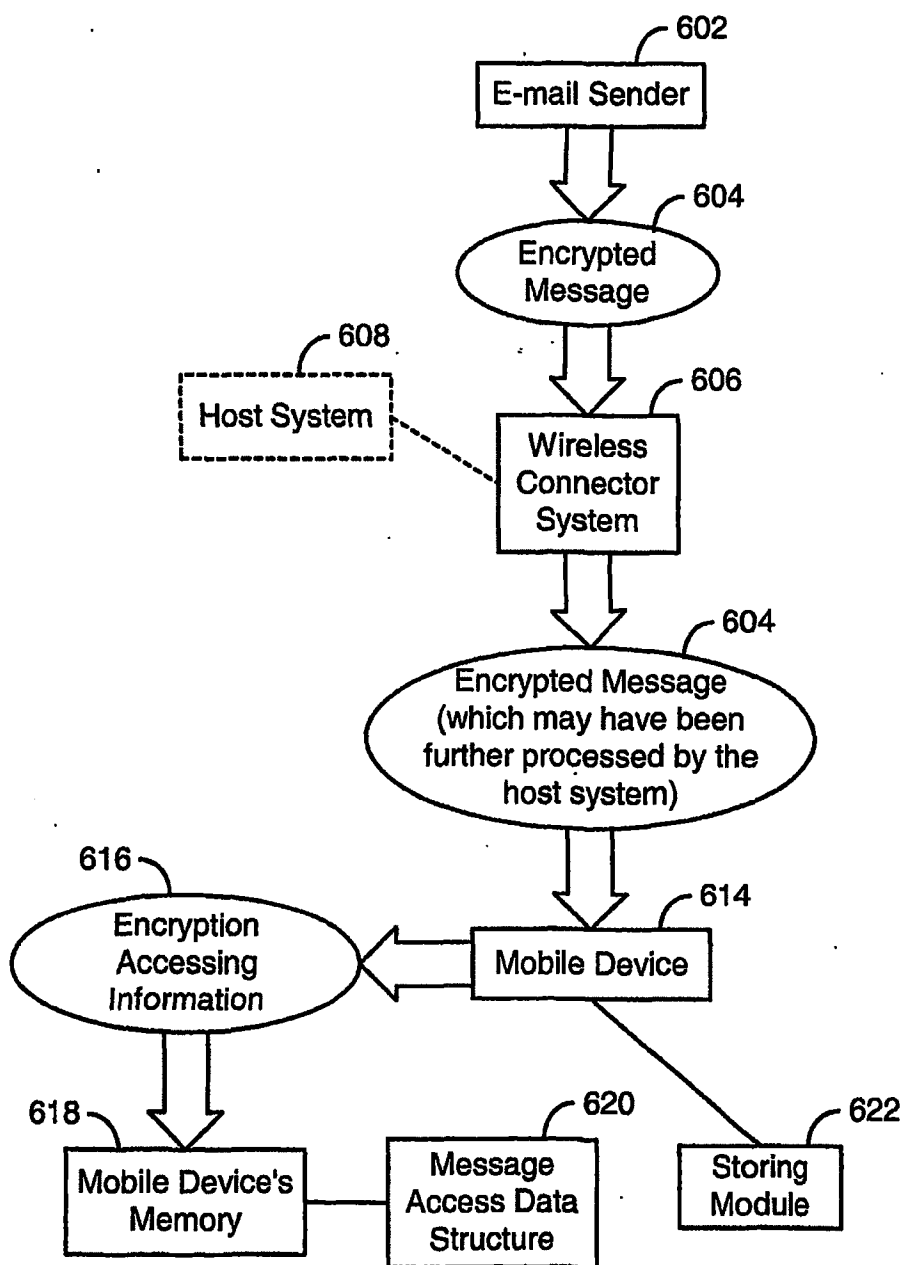


FIG. 6

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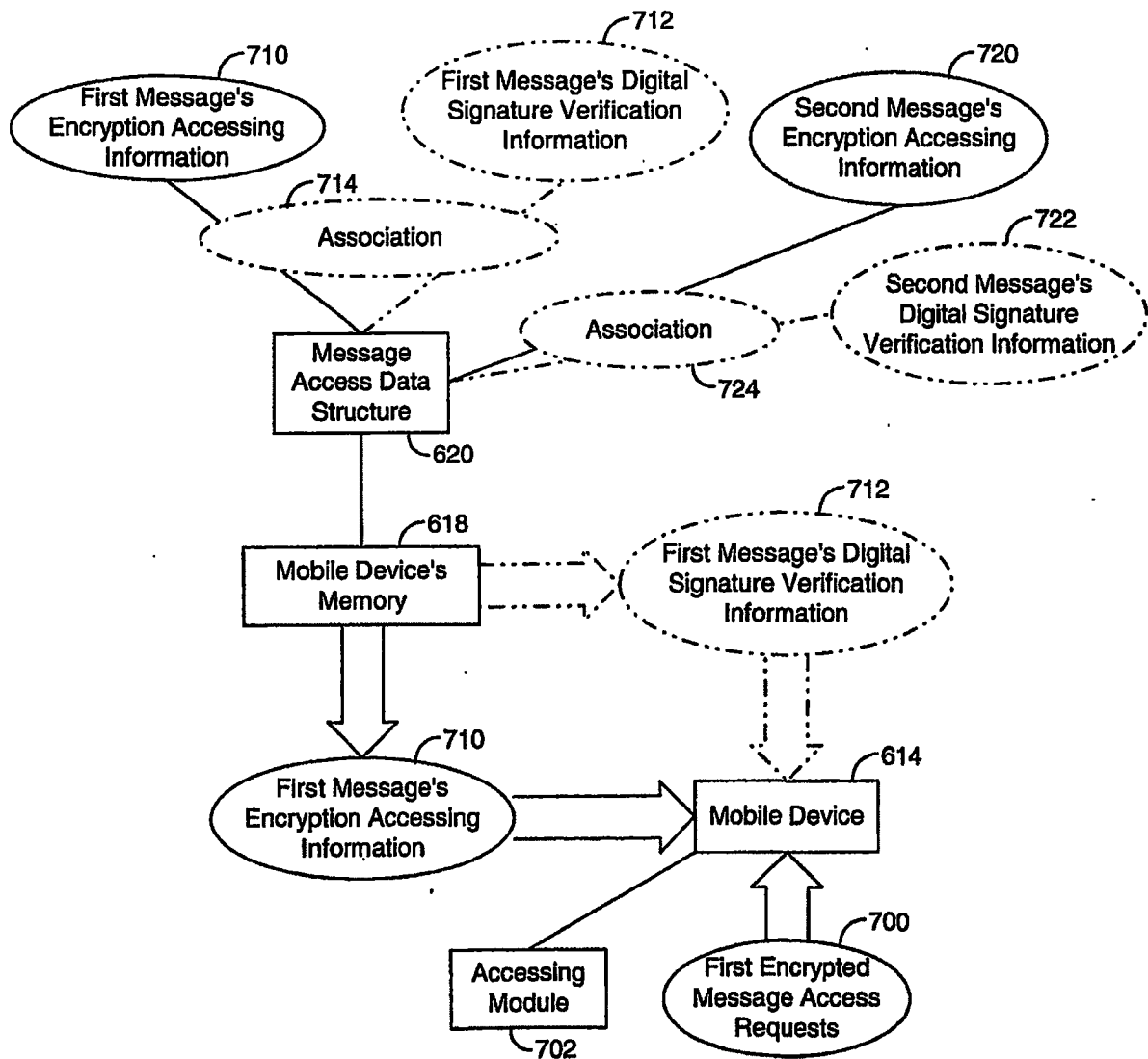


FIG. 7

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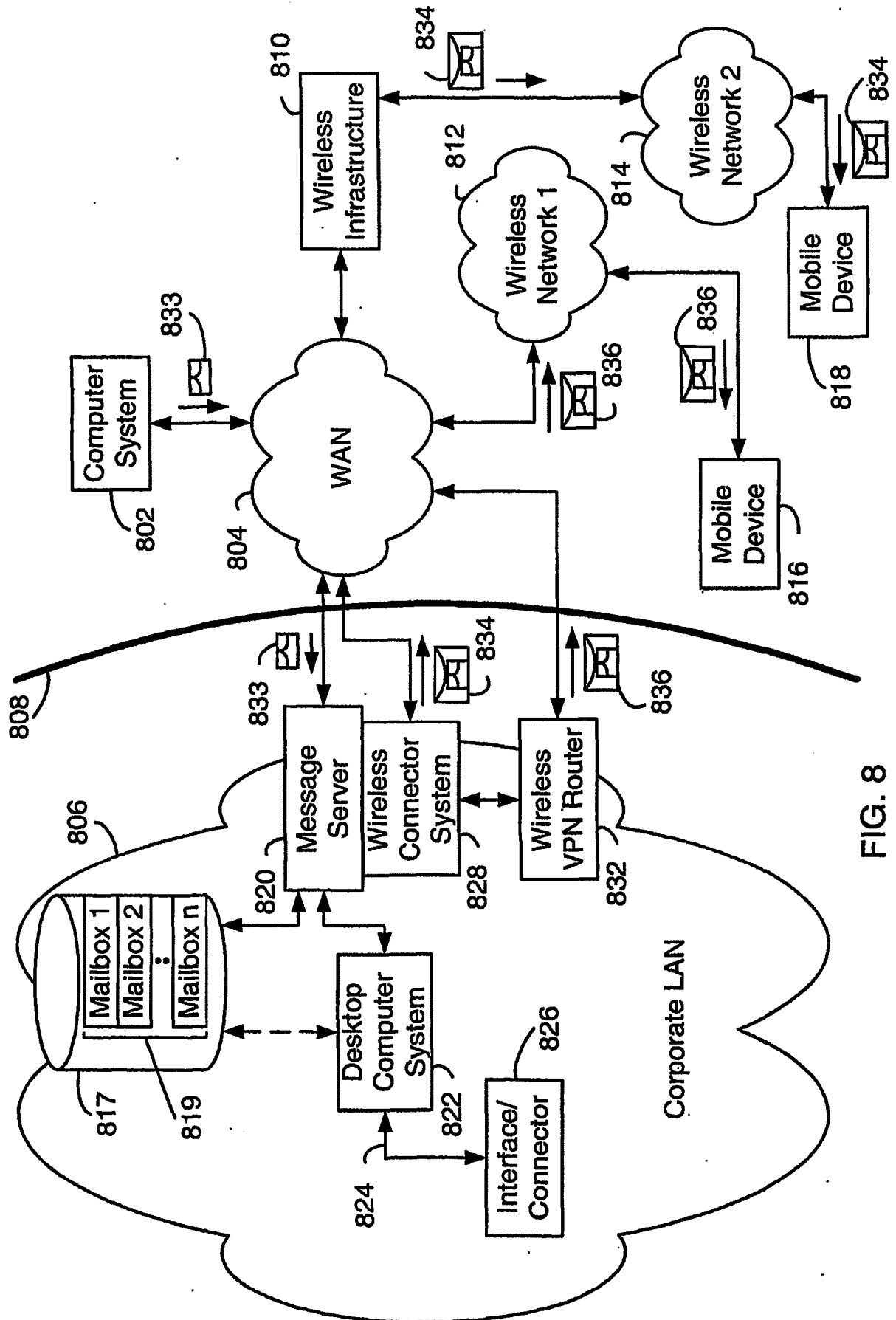


FIG. 8

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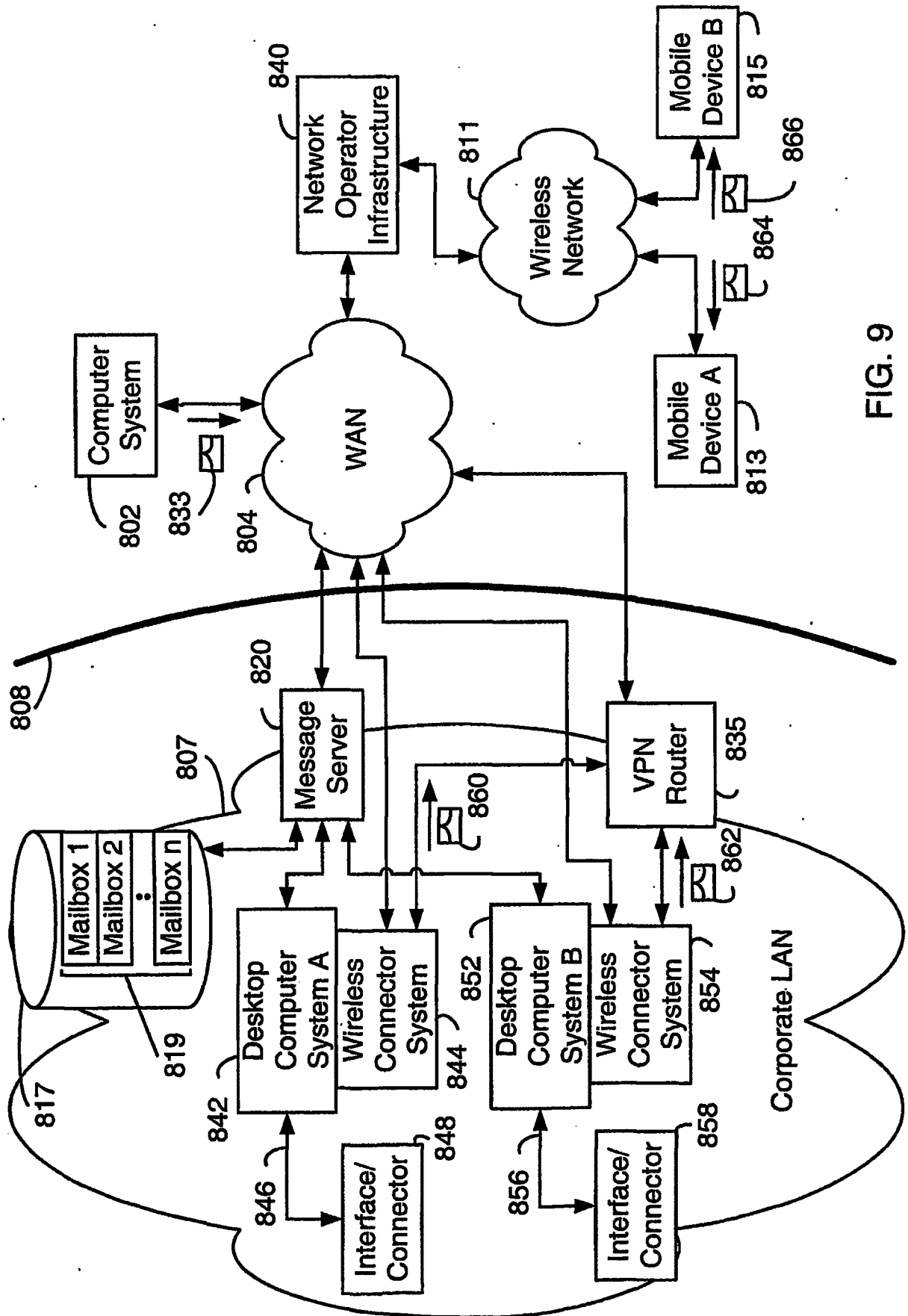


FIG. 9

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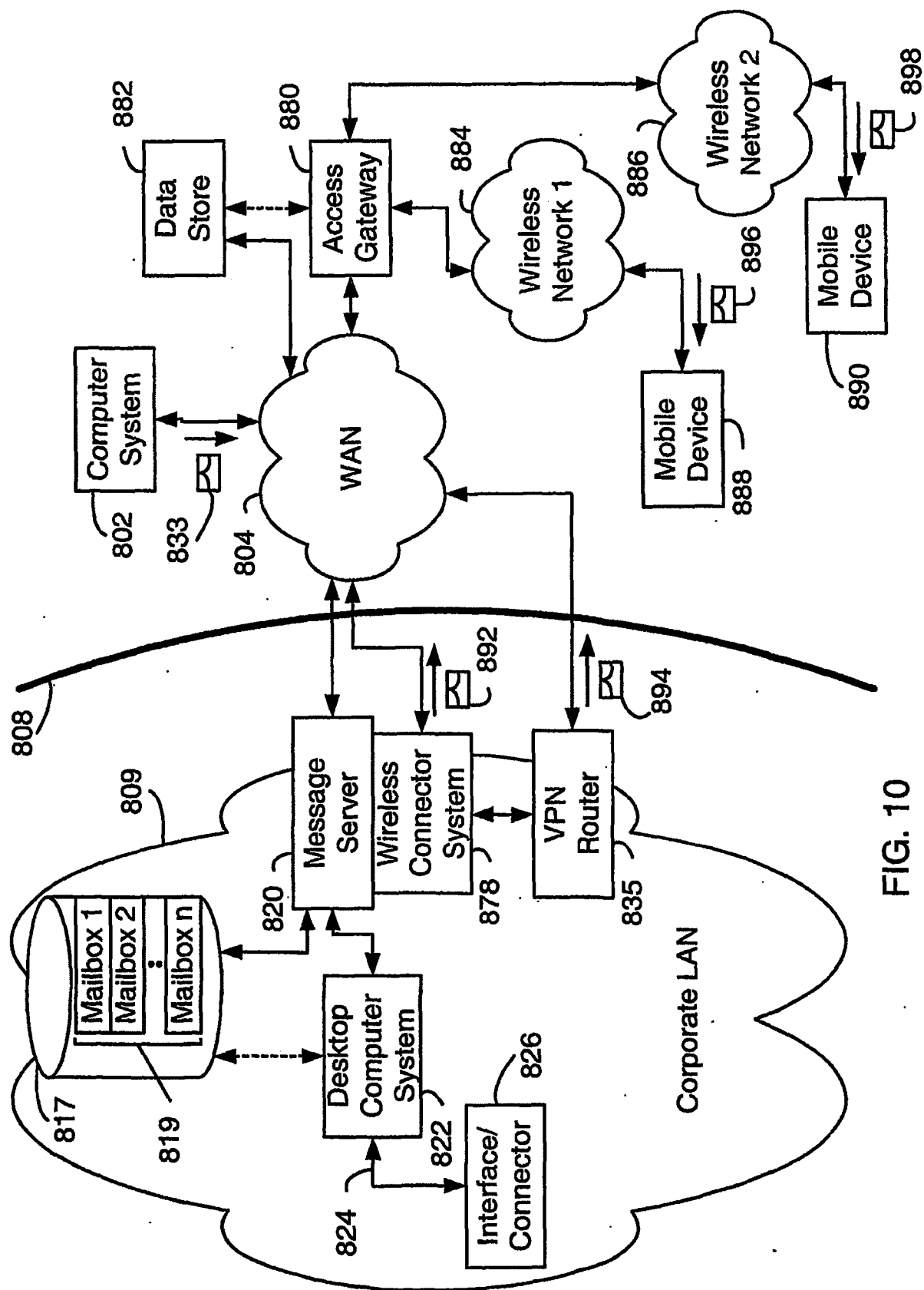


FIG. 10

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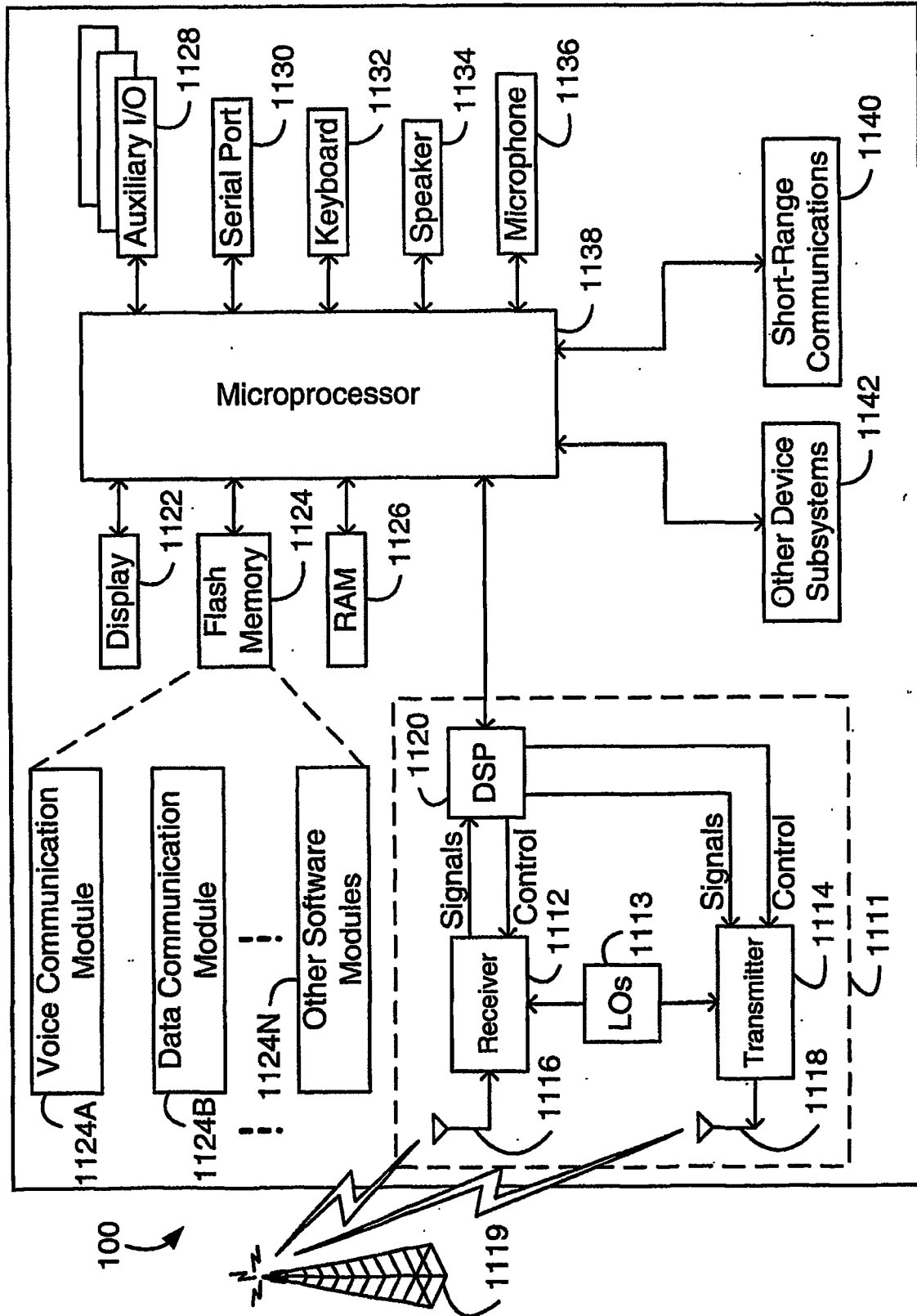


FIG. 11

INTERNATIONAL SEARCH REPORT

 Application No
 PCT/CA 02/01060

 A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 H04L29/06 H04L12/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04L G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, COMPENDEX, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

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Kopp, K

INTERNATIONAL SEARCH REPORT

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